interfering with difference of path of over a million waves, such a grating would have a resolving power exceeding a million.

This investigation has had assistance from the Bache Fund of the National Academy of Science, from the Carnegie Institution, and from the University of Chicago. In addition to the grateful acknowledgement to these institutions I would add my high appreciation of the faithful services rendered by Messrs. Julius Pearson and Fred Pearson.

A HIGHLY SENSITIVE ELECTROMETER

By A. L. Parson

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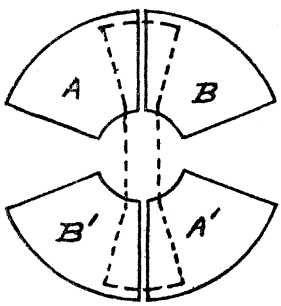
Presented to the Academy, June 3, 1915

In this instrument the principle of working in a condition approaching instability is used to increase greatly the sensitiveness of the quadrant electrometer, which, even in its ordinary form, is more sensitive than other electrometers in which this condition of instability has been employed. The box-shaped quadrants are replaced by flat sectors subtending about 70° each at the centre and arranged as shown in the figure. Because of the two large gaps between A and B′, and between A′ and B, the needle hangs stably, as shown by the dotted lines, by virtue of electric forces quite apart from the torsion of the suspension. (Incidentally, this makes it possible to use a torsionless suspension or a float for the needle, which latter has been tried with some success.) If now a potential-difference is set up between AA′ and BB′ the needle is deflected, at first nearly proportionately to the potential difference, and then less and less as the large gaps are approached.



A HIGHLY SENSITIVE ELECTROMETER

The approach to instability and hence an increase in sensitiveness is brought about by means of a mechanical device, which on turning a micrometer screw can be made to widen the small gaps between A and B and between A′ and B′, thus making the needle less and less stable in its central symmetrical position. In this way the sensitivity which in the least sensitive condition is about 3 mm. per millivolt at a scale distance of 5 metres can be raised to as much as 60 mm. per millivolt easily, and with some care even to 150 mm. per millivolt.

A most important feature of the instrument is that, on account of the relative unimportance of the thickness of the quartz suspension, the

sensitivity to potential-differences is practically independent of the size of the instrument. The last model made, with a needle 1.8 cm. long, has a capacity of 9 cm., but this could without difficulty be halved by reducing the size of the instrument; and it might be halved again by omitting one end of the needle and the pair of sectors below it.

Although the sensitivity of the electrometer (with the very efficient optical system used) is theoretically great enough to detect 10^{-6} volt, it has not as yet been made steady enough to detect an isolated potential-difference of less than about 3×10^{-5} volt.

The details of the construction of the instrument and the results of measurements made with it, together with a consideration of the cause of the residual unsteadiness will be discussed in a more extended article to be published shortly.

THE DISTRIBUTION AND FUNCTIONS OF TRIBAL SOCIETIES AMONG THE PLAINS INDIANS: A PRELIMINARY REPORT

By Clark Wissler

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Presented to the Academy, June 2, 1915

For several years the American Museum of Natural History has been engaged in systematic anthropological field-work among the surviving Indians of the great Plains area in North America pertaining to one definite problem, viz., the distribution and functions of tribal societies. Early observers noted the existence of societies, chiefly for men, which within the tribe seemed to be correlated and in some cases organized into progressive series, or ranks. Some data more or less fragmentary were recorded by Lewis and Clark, Catlin, and Maximilian in early days, and later by Grinnell and J. O. Dorsey. The first serious investigation of such societies was undertaken by A. L. Kroeber among the Arapaho. This was followed by work among the Cheyenne by G. A. Dorsey, among the Assiniboin by R. H. Lowie, and among the Blackfoot by me. These pioneer studies revealed such striking similarities between these four tribal systems of societies as to suggest a case of culture diffusion.

The significance of the problem may appear from the following brief statement; two investigators had previously made special use of what data were then available on these societies in their respective efforts to explain such phenomena as manifestations of a yet to be discovered law of social evolution.[1] In each case the method was the same, one employed by many ethnologists and sociologists; viz., to collect examples of tribal societies from several parts of the world and to theoretically